

STATE WATER RESOURCES CONTROL BOARD
BOARD MEETING SESSION – CENTRAL VALLEY WATER BOARD
Comment Summary and Responses
Comment Deadline: November 2, 1017

**AMENDMENT TO THE WATER QUALITY CONTROL PLAN
FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS
FOR THE CONTROL OF PYRETHROID PESTICIDE DISCHARGES**

On June 8, 2017, the Central Valley Regional Water Quality Control Board (Central Valley Water Board) adopted Resolution R5-2017-0057, amending the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) to establish a control program for pyrethroid pesticides.

The State Water Resources Control Board (State Water Board) provided interested persons the opportunity to submit written comments on the proposed approval of the Basin Plan Amendment. This document contains responses to written comments submitted to State Water Board staff during the October 3 – November 2, 2017 comment period.

Written comments were received by:

Comment Reference	Organization	Representative
1	Central Valley Clean Water Association California Association of Sanitation Agencies	Debbie Webster Greg Kester
2	Mosquito and Vector Control Association of California	Brian White
3	Pacific Coast Federation of Fishermen's Associations and the Institute of Fisheries Resources	Regina Chichizola
4	Sacramento Regional County Sanitation District	Linda Dorn
5	Somach Simmons & Dunn on behalf of the Pyrethroid Working Group	Theresa Dunham
6	University of California, Berkeley	Donald Weston
7	Western Plant Health Association	Renee Pinel

1. CENTRAL VALLEY CLEAN WATER ASSOCIATION (CVCWA); CALIFORNIA ASSOCIATION OF SANITATION AGENCIES (CASA)

Comment letter was received by the State Water Board on November 2, 2017.

CVCWA et al. Comment No. 1: Conditional prohibition should apply to the receiving water – not the discharge. CVCWA and CASA have continually stated that the discharge prohibition and triggers should apply to the receiving water, not POTW effluent. CVCWA submitted proposed language in its March 24, 2017 letter to clarify application of the discharge prohibition. The Central Valley Water Board has been unwilling to make these changes declaring that it is more practical to have POTWs measure effluent rather than the receiving water. In this case, CVCWA continues to recommend application of the discharge prohibition and triggers to the receiving water as it is the appropriate place of compliance.

RESPONSE: The Central Valley Water Board previously responded to this comment in June 2017. Although no explanation was given why the Board's prior response was inadequate, the Board's prior response is summarized here to provide clarity as to the Board's perspective.

The recommended approach applies the conditional prohibition to discharges rather than the receiving water for several reasons. The pyrethroids control program is focused on source control and accountability, which requires a clear link between detected pyrethroids and the individual dischargers responsible for an exceedance of the trigger. Establishing this link is comparatively straightforward when applying the prohibition to the discharge as opposed to receiving waters. The cause of exceedances of the trigger in receiving waters may have contributions from other sources, such as nonpoint discharges. Applying the triggers to discharges rather than receiving waters will ensure that trigger exceedances in receiving waters attributable to other sources of pyrethroids (e.g., urban runoff) are not incorrectly attributed to wastewater dischargers. Further, amendment states that in reviewing management plans, the Executive Officer shall consider the potential impact of the pyrethroid discharge and whether the actions proposed are commensurate with the potential impact.

Though the prohibition would legally apply at the discharge for all discharge categories, monitoring requirements to detect trigger exceedances will differ for some discharge categories based on practical considerations. For example, representative receiving water monitoring is appropriate for irrigated agriculture and municipal storm water because their discharges of pyrethroids are too geographically diffuse for individual outfall- or field-level monitoring to be practicable. The proposed Basin Plan Amendment has been revised to clarify that representative receiving water monitoring can be used for irrigated agriculture and municipal storm water discharges. In contrast, wastewater discharges consist of a small number of discrete point sources, for which it is practical to monitor discharges directly. However, if wastewater discharges are similar for a group of dischargers, in some cases those dischargers may use representative discharge monitoring to represent the group.

CVCWA et al. Comment No. 2: A central component of the Pyrethroid Amendment is the inclusion of numeric triggers for pyrethroid pesticides in the implementation provisions, rather than the adoption of water quality objectives for pyrethroids. We support this approach for a variety of reasons. Most importantly, as articulated in Provision 16 of Resolution R5-2017-0057, there is insufficient information available for the Central Valley Water Board to properly consider the factors established by Water Code section 13241. Before adopting any water quality objective, the Central Valley Water Board is required to consider the factors specified in Water Code section 13241. In the absence of information necessary to consider these factors, it is inappropriate for the Central Valley Water Board to adopt water quality objectives. Thus, rather than adopting improper water quality objectives, the Central Valley Water Board is proposing to use numeric values to "trigger" the need for further management actions.

RESPONSE: Support noted.

CVCWA et al., Comment No. 3: Further, we support the language within the Pyrethroid Amendment that directly states the triggers shall not be used to interpret narrative water quality objectives or be used in a reasonable potential analysis. This language is essential for POTWs as it provides assurance that Central Valley POTWs will not receive water quality based effluent limitations for constituents for which they have no control.

RESPONSE: Support noted. It should be noted that while the proposed Basin Plan Amendment language does provide that the triggers themselves would not be utilized to interpret narrative water quality objectives in a reasonable potential analysis, and provides some assurances with regard to the Central Valley Water Boards course of action in addressing pyrethroids under this amendment, the proposed Basin Plan Amendment language does not preclude the Central Valley Water Board or the State Water Board from utilizing any of their authorities for the control of discharges.

CVCWA et al. Comment No. 4: “As noted in the CVCWA March 24, 2017 comments, we support the use of 5th percentile concentration goals in the numeric trigger calculations. These values are conservative and include many conservative assumptions in their development. The Central Valley Water Board properly adopted the 5th percentile values for use in the concentration goal calculations rather than the 1st or 2.5th alternatives for several reasons. The 5th percentile values are appropriate, as they are consistent with U.S. EPA’s *Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*; and, two of three peer reviewers noted that the 1st percentile values were overly conservative and that the 5th percentile values were protective. When the Central Valley Water Board reviews the triggers in the future, as required in the Pyrethroid Amendment, they can then determine if there is a more appropriate value that should be used as a trigger or criteria at that time.”

RESPONSE: Support noted.

CVCWA et al. Comment No. 5: “A key issue of concern for the POTWs is the lack of reliable commercial analytical methods for the wastewater matrix, and the surveillance and monitoring requirements. CVCWA and CASA appreciate and support the Central Valley Water Board’s efforts to continue to clarify that such methods will be considered in the Central Valley Water Board’s evaluation of monitoring data. However, it is more appropriate to suspend monitoring requirements for POTWs until such time that reliable commercial analytical methods are available that apply to the wastewater matrix.”

RESPONSE: There are currently laboratory methods that can be used by commercial laboratories to analyze pyrethroids in the wastewater matrix at levels approaching, but not below, levels of concern. Given the potential impacts of pyrethroid discharges from POTWs, significantly delaying the monitoring that is critical to the proposed control program is not warranted at this time. However, staff acknowledge that methods could benefit from additional reductions in the reporting limits and efforts to ensure comparability.

Adequate laboratory capacity and standardized or harmonized protocols will be necessary to ensure reliable data to support the proposed control program. Central Valley Water Board staff have begun engaging with State Board staff in the Environmental Laboratory Accreditation Program (ELAP) and Surface Water Ambient Monitoring Program (SWAMP) in order to ensure that there will be reliable methods and protocols for the analyses needed for this Basin Plan Amendment, and discussion of these ongoing activities is included in Section 8.5 of the Staff Report.

ELAP provides evaluation and accreditation of environmental testing laboratories to ensure known and documented quality and defensibility of analytical test methods for regulatory purposes. ELAP-accredited laboratories have demonstrated capability to analyze environmental samples using approved methods.

When feasible, the use of ELAP-accredited methods is recommended for both chemical analyses of pyrethroids and toxicity testing with *Hyalomma azteca*. Typically, there are multiple laboratories accredited for a particular analytical test method and Regional Board staff is working with ELAP to request that more laboratories become accredited for pyrethroids analysis and *Hyalomma azteca* toxicity testing. Regional Board staff is working through an established framework for state agency requests to ELAP for new analytical test methods and lowered reporting limits to ensure there are reliable methods for pyrethroids chemical analysis and toxicity testing with *Hyalomma azteca* available from multiple laboratories. Through this process, Regional Board staff will also request that the Chief of ELAP contact all laboratories accredited in Fields of Testing (FOT) relevant to pyrethroids chemical analysis (FOT 105 and/or FOT 111 – Semi-volatile organic chemistry) and toxicity testing (FOT 113/119 – Toxicity bioassay) to request that more laboratories offer pyrethroids analysis and testing with *Hyalomma azteca* in order to encourage more laboratories to offer these analyses.

Currently, ELAP can only accredit labs for standardized methods, which are not available for all six of the pyrethroids included in this amendment; however, in the future they will be transitioning their program to accredit for non-standardized methods. Because standardized methods are not available for all six pyrethroids, other methods may be used to obtain the required data, as is being done in various programs throughout the state in which pyrethroid monitoring is required. Additional description of the available methods and recommendations for monitoring has been added to sections 8.4-8.6 to the draft Staff Report.

NPDES dischargers are typically required to use ELAP-accredited labs for their analyses, however if dischargers do not use ELAP-accredited labs, additional quality assurance and quality control information would need to be provided to ensure the results will be reliable.

Guidance on the factors to be considered by the Executive Officer in approving acceptable methods is included in the proposed Basin Plan Amendment. Under the proposed Basin Plan Amendment, the Executive Officer will consider whether the method is ELAP-accredited, whether a new method has undergone independent scientific peer review or has been part of an inter-laboratory study design, if there is a quality assurance project plan (QAPP) in place that can provide assurance that the method used will be reliable, or other factors in determining acceptable methods. Additionally, the proposed Basin Plan Amendment includes a commitment of the Central Valley Water Board to develop a Pyrethroid Research Plan within two years, and topics for the plan may include “consideration of monitoring and laboratory methods for both pyrethroid chemistry and toxicity testing and inter-laboratory comparison.” All stakeholders, including the commenters, are encouraged to participate in that process to help ensure the data are developed to inform the Board in the implementation of the control program.

CVCWA et al. Comment No. 6: “The POTWs actively participated in the Central Valley Water Board’s stakeholder process. While such processes tend to take longer, the end result is typically better and more robust. The same holds true for the Pyrethroid Amendment. The Central Valley Water Board held numerous stakeholder meetings, and provided many opportunities for early comments during the development of the Pyrethroid Amendment. As a result, the Pyrethroid Amendment reflects input by many. For this, we thank the Central Valley

Water Board and their staff for making the time and resource commitment to the stakeholder process.”

RESPONSE: noted.

2. MOSQUITO AND VECTOR CONTROL ASSOCIATION OF CALIFORNIA (MVCAC)

Comment letter was received by the State Water Board on November 1, 2017.

MVCAC Comment No. 1: The commenter stated that “...we are pleased that the proposed Basin Plan Amendment to the Water Quality Control Plan recognizes our public health imperative by acknowledging that ‘discharges of pyrethroids from vector control applications are subject to Statewide NPDES Permit for Biological and Residual Discharges to waters of the United States from Vector Control Applications.’ As a result, ‘vector control discharges are not subject to any additional implementation provisions for attainment of the pyrethroid triggers or TMDLs for pyrethroids.’ We agree with this conclusion as the State Water Board moves forward in adopting a revised Water Quality Plan for the Sacramento River and San Joaquin River Basins. We believe this is the appropriate path forward in balancing the needs to protect public health while ensuring protection of water quality objectives.”

RESPONSE: Support noted.

3. PACIFIC COAST FEDERATION OF FISHERMEN’S ASSOCIATIONS & INSTITUTE OF FISHERIES RESOURCES (PCFFA & IFR)

Comment letter was received by the State Water Board on November 2, 2017.

PCFFA & IFR Comment No. 1: The Pacific Coast Federation of Fishermen’s Associations and the Institute of Fisheries Resources wish to submit the following comments regarding the proposed Basin Plan Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Pyrethroid Pesticide Discharges. These comments are meant to supplement previous comments from the Institute for Fisheries Resources (IFR), Pacific Coast Federation of Fishermen, the San Francisco Baykeeper, the Environmental Coalition for Water, California Sportfishing Protection Alliance, and the Pesticide Action Network. Between our groups we represent the state’s commercial and recreational fishermen, as well as water users and agricultural workers and consumers. We are attaching our previous comments dated March 24th, 2017.

RESPONSE: The commenters, along with San Francisco Baykeeper, the Environmental Justice Coalition for Water, California Sportfishing Protection Alliance, and the Pesticide Action Network provided comments to the Central Valley Water Board on in March 2017 (March Comment Letter). The Central Valley Water Board responded to these comments. The March Comment Letter was appended to the commenters’ November 2, 2017 letter to the State Water Board, but the commenters did not offer any explanation why the Central Valley Water Board’s prior responses were inadequate. Nevertheless, in the interest of providing clarity, responses to the issues raised in the March Comment Letter are reproduced or summarized below with the notation “**PCFFA et al. APRIL COMMENT LETTER Comment No. #**”.

PCFFA & IFR Comment No. 2: We are concerned that this amendment is not protective of fisheries or water quality and is not scientifically proven or justifiable. IFR represents commercial fishermen who have faced extremely restrictive salmon seasons many years within the last twenty years, therefore the state of the San Joaquin and Sacramento River are of economic importance to the fishing industry and all the other industries and communities we support. The Sacramento River Fall Chinook ocean abundance projection declined from 652,000 in 2015 to around 300,000 in 2016. The number of salmon-permitted vessels has declined from approximately 5,000 in 1980 to approximately 1,100 today. In 2015, only 585 vessels actually landed salmon in California. Fisheries and fishery-dependent coastal communities are suffering from back-to-back resource crises, with a poor salmon season in 2015 and 2016, loss of half of the crab season, and the prospect of another poor salmon season this year. Sacramento Fall chinook are not overfished. Their abundance declines are due to the deterioration of river productivity which is caused by reduced flows, habitat degradation, the presence of toxic chemical species at mutagenic and lethal concentrations, and many other factors.

Fishermen bear the financial burdens of these impacts, which in many cases occur in contravention of the law, past settlements, and management plans. Pyrethroid discharges are no exception.

RESPONSE: Comment acknowledged.

PCFFA & IFR Comment No. 3: We are especially concerned with the cumulative impacts of pyrethroid pesticides with other chemicals that are entering the watershed such as diazinon and chlorpyrifos, and with other water quality pollutants such as selenium, nitrates, salts, temperatures, poor pH, and phosphates. We have requested that an analysis of the cumulative effects of introduction of these various chemicals on water quality be included in the basin amendment documents, however this request seems to have been ignored. This is unacceptable.

RESPONSE: Additive and synergistic effects with other constituents and impacts of other stressors (e.g., temperature) are among the factors that were considered by the Board, as described in the Staff Report. When analyzing the cumulative impacts associated with the adoption of a proposed Basin Plan Amendment, the Board reviews the direct and indirect environmental impacts relative to an environmental baseline, which is defined as the physical conditions existing at the time the agency commences its environmental review. Baseline conditions for this review consider current pyrethroid concentrations in the Sacramento and San Joaquin River watersheds. The proposed Basin Plan Amendment is designed to reduce pyrethroid concentrations in these watersheds, which is expected to result in improved aquatic habitat, even considering other stressors. This informs the conclusions of the Board's environmental analysis.

PCFFA & IFR Comment No. 4: We thank the board for their effort to control this dangerous toxin, however we are opposed to the adoption of this amendment in its current form because it is not protective of water quality or fisheries and is not based on sound science. We are asking for several changes to the proposed Basin Plan Amendment based on our concerns as well as the concerns of the California Department of Fish and Game and the Environmental Protection Agency. We feel that our voices have not been heard throughout this process. We have provided science and comments supporting a stronger science based approach. The Regional Board has instead ignored significant scientific controversy and numerous studies that contradict their unproven approach. We feel that the Regional Board has ignored comments that

do not support their approach, including comments from state and federal scientists and experts on Pyrethroid toxicity and fisheries.

We are most concerned with the issues of sediment toxicity, cumulative impacts with other Pyrethroids and toxins, non-lethal impacts to aquatic species, stormwater and temperature impacts, current receiving water conditions, and lack of assimilative capacity of highly impaired watersheds. These issues were not adequately addressed in the Response to Comments.

The best examples to support our claims are the facts that temperature and agricultural stormwater are not addressed at all in this plan even though they are perhaps the most important variables influencing in Pyrethroid discharges and toxicity. Additionally, the non-lethal impacts to aquatic life at different life stages and the cumulative impacts to fisheries are not accounted for.

RESPONSE: The Central Valley Water Board has provided responses to all comments submitted, including the scientific comments provided by the commenters as well as the California Department of Fish and Wildlife and the US Environmental Protection Agency. The Central Valley Water Board's Staff Report and responses to comment provide the scientific and policy basis for the proposed Basin Plan Amendment and have provided what the Board believes to be reasonable resolutions for the scientific and other concerns that have been raised throughout the process. The proposed Basin Plan Amendment is expected to result in significant reductions in pyrethroid concentrations. The Central Valley Water Board analyzed and considered, as documented in the Staff Report, potential sediment toxicity, cumulative impacts, non-lethal impacts, stormwater and temperature, current receiving water conditions and assimilative capacity. Briefly summarized here, the attainment of the concentration goals in the water column is expected to resolve most sediment toxicity, would prevent sub-lethal impacts on fish species, and pyrethroids at these concentrations are not expected to significantly contribute to any cumulative impacts.

The proposed Basin Plan Amendment does not ignore agricultural stormwater. The proposed Basin Plan Amendment includes provisions which would regulate concentrations of pesticides from agricultural stormwater discharges, as they are a known source of pyrethroids. Potential temperature effects on pyrethroid toxicity and sub-lethal effects on fish were considered by the Board in adopting the proposed Basin Plan Amendment, as documented in the Staff Report. It is not possible at this time to explicitly include temperature in the concentration goals. Potential sub-lethal impacts on fish were considered, and the concentration goals are all lower than any quantified lethal or sublethal acute or chronic fish toxicity threshold.

The proposed Basin Plan Amendment also includes a commitment from the Central Valley Water Board to work with stakeholders to develop a Pyrethroid Research Plan within two years that will describe research and studies to inform future iterations of the control program. Potential refinement of partition coefficients, further assessing the need to incorporate temperature effects in toxicity relationships, consideration of synergists and potential mixture effects with other commonly occurring contaminants (e.g., piperonyl butoxide) on pyrethroid toxicity; consideration of the need for chronic toxicity values for taxa for which data are not currently available, and evaluation of sub-lethal effects, and fate and transport of particulate bound pyrethroids were all topics identified in the proposed Basin Plan Amendment that may be included in the Research Plan. All stakeholders, including the commenters, are encouraged to participate in that process to

help ensure the data are developed to inform the Board in the implementation of the control program.

When new information becomes available in the future regarding these potential effects, this information will be considered by the Central Valley Water Board when the Board revisits the pyrethroids control program, which the Board could imitate any time but has committed to doing no later than 15 years after the effective date of the Basin Plan amendment

PCFFA & IFR Comment No. 5: We find it very troubling that the board has not only adopted the least protective alternative, but it also uses an unproven and highly controversial bioavailability standard that ignores over 90% of the Pyrethroid concentrations. This approach is not supported by any involved agency, and has not been applied anywhere in the country. Surely the Bay Delta and Central Valley watersheds which are suffering an ecological collapse, host over half a dozen aquatic endangered species, and supply water to millions of people are not the proper places to test unproven and non-protective approaches to protecting water quality from toxic pesticides.

We are requesting that the State Board deny this proposal because of the flawed and unproven bioavailability approach and orders the Regional Board to deal with whole water concentrations as other regions have done. We also request that the State Board apply a more protective alternative.

RESPONSE: It is true that using the freely dissolved concentrations has not previously been used for regulation of pyrethroids in water. However, this approach is based on the best available science to provide the most accurate measure of the toxic potential of pyrethroids. Accounting for bioavailability of pyrethroids in environmental samples will result in a more accurate predication of potential toxicity to aquatic organisms in aquatic ecosystems. This is a reasonable approach that protects aquatic life, while accounting for environmental characteristics and reducing the likelihood that samples that would not cause harm to aquatic organisms would be determined to exceed the pyrethroid concentration goals. The technical basis of the proposed bioavailability approach was supported by the independent scientific peer reviewers.

While this control program utilizes freely dissolved concentrations to assess attainment, their use does not mean that pyrethroids bound to sediment or organic matter would be “ignored”, since a fraction of those pyrethroids that are bound will always be in the freely dissolved form, and that fraction would need to be below the concentration goals. The challenges in their control and potential large reductions needed, and the potential environmental and economic impacts from over-protective regulation of pyrethroids (including potential impacts of alternative insecticides) warrant the Board take a balanced approach in their regulation. For these reasons the bioavailability approach in the proposed Basin Plan Amendment is appropriate.

The proposed Basin Plan Amendment would require toxicity testing with *Hyalomma azteca* to provide additional information regarding the toxicity of pyrethroids in the dissolved phase and those bound to organic matter and/or particles. Toxicity testing of both water and sediment will provide information necessary to assess whether there are ambient toxicity concerns. If pyrethroid levels in sediment are reduced below levels toxic to *Hyalomma azteca*, which is the most sensitive organism that has been tested, then they will also be below any levels with potential to cause toxicity to organisms that ingest

sediments. Staff will evaluate how the chemical analysis data and toxicity testing results correspond as this data is collected. This is a phased control program and the Regional Board is committed to re-visiting the program, including the use of the freely dissolved pyrethroid concentrations and the partition coefficients used to estimate the freely dissolved concentrations, no later than 15 years after the proposed Basin Plan Amendment is effective.

PCFFA & IFR Comment No. 6: In the responses to comments the Waterboard defends their consideration of only the freely dissolved fraction of pyrethroids. They cite a study by Knauer as support of this approach: “Knauer et al. (in press) also stated that pyrethroids were the only class of pesticides that did show a reliable decrease in bioavailability due to binding to organic matter, confirming that this approach is reasonable for pyrethroids, although it may not be for other classes of pesticides”. While Knauer is correctly quoted in regards to OC, the Water Board conveniently ignores the entirety of the study in favor of their freely dissolved fraction approach. *[Commenters quote and interpret a section of the Knauer et al. paper which discussed another study which indicated pyrethroid exposure via ingestion of particle-bound pyrethroids, and states that the Central Valley Water Board ignored the complexity of the science behind bioavailability and “cherry picked” the science in favor of less protective limits.]*

RESPONSE: As acknowledged in the Staff Report, there can be some exposures to bound pyrethroids due to such factors as the ingestion of sediments. As Stated in Section 5.2.2 of the Staff Report: *“The bioavailable concentration is not directly equivalent to the freely dissolved concentration, because the freely dissolved concentration neglects exposure via ingestion of chemicals bound to food sources, or absorption directly through exterior membranes. However, many studies have demonstrated that the freely dissolved concentration is highly correlated with the bioavailable fraction and is a good predictor of bioavailability.”* Studies showing this correlation include Bondarenko et al. 2007, Bondarenko and Gan 2009, Hunter et al. 2008, Xu et al. 2007, and Yang et al. 2006a, 2006b, 2006c, 2007). Also See Response to PCFFA & IFR Comment No. 5.

PCFFA & IFR Comment No. 7: While the bioavailability method is flawed in itself, the intended execution of this method is lacking scientific basis. The Water Board intends to calculate the bioavailable fraction using partition coefficients.

[The commenters state that the Central Valley Water Board has expressed the importance of site-specific partition coefficients. Commenters quote passages from a pyrethroid criteria document (Tjeedema, 2012) which states that site specific partition coefficients are needed for compliance calculations. Commenters further state that the default partition coefficients in the proposed Basin Plan Amendments cannot capture the range of coefficients for different seasons and locations and are unacceptable for compliance determination, and that site-specific coefficients are needed.]

The Regional Board states that the “proposed Basin Plan Amendment allows for the use of site-specific or additional study-based partition coefficients if they become available”. They are currently unavailable and the Regional Board has no intention of collecting these values, making the implementation of this approach unfounded. The calculation could be considered in the future if these values become available. But, they are currently unavailable and the calculation is worthless without them. The use of literature partition coefficients is unfounded and blatantly goes against the stated requirements for using the freely dissolved fraction calculation.

RESPONSE: Under the proposed Basin Plan Amendment, partition coefficients are factors used to estimate the fraction of pyrethroid detected in a sample that will be bound to organic material in the water, and the fraction that will be “freely dissolved” (not bound to organic material). This remaining “freely dissolved” pyrethroid in the sample is then used to assess attainment of the concentration goals. It is true that partition coefficients can vary greatly depending on the nature of the particles, and the Staff Report acknowledges this in section 5.2.2.2. A range of experimental partition coefficients are shown in Table 5-1 and Table 5-2 of the Staff Report, which demonstrate the potential range of values that may be encountered in environmental samples. The proposed partition coefficients are not at the extremes of the range of partition coefficients; all of the proposed partition coefficients fall within the second and third quartiles of the range (47th-75th percentile of the range of partition coefficients presented in Table 5-1 and Table 5-2 of the Staff Report). The proposed partition coefficients were recommended because they were determined using an analytical technique that minimizes calibration errors, which may cause partition coefficients to be overestimated. In addition, the proposed Basin Plan Amendment allows for the use of site-specific or additional study-based partition coefficients if they become available. The technical basis of the proposed bioavailability approach, including the use of the proposed partition coefficient was supported by the independent scientific peer reviewers. Also, as new information becomes available, these values may be refined to reflect the newest scientific information.

The proposed Basin Plan Amendment also includes a commitment from the Central Valley Water Board to work with stakeholders to develop a Pyrethroid Research Plan within two years that will describe research and studies to inform future iterations of the control program. Potential refinement of portion coefficients is one of the topics identified in the proposed Basin Plan Amendment that may be included in the Research Plan. All stakeholders, including the commenters, are encouraged to participate in that process to help ensure the data are developed to inform the Board in the implementation of the control program.

When new information becomes available in the future regarding the environmental effects of pyrethroids, this information will be considered by the Central Valley Water Board when the Board re-visits the pyrethroids control program, which the Board could imitate any time but has committed to doing no later than 15 years after the effective date of the Basin Plan amendment.

PCFFA & IFR Comment No. 8: The selected partition coefficient range shows an additional bias towards the estimation of lower pyrethroid concentrations. The Regional board states that the “partition coefficients used are not extremes”. The range they use is the 47th – 75th percentile. While it is true that this is not the extreme, the range is the third highest quartile of partition coefficient values. This means that the values used are towards the higher end of K values. Higher K OC values correlate to less mobile chemicals as they signify that more chemical is adsorbed to organic carbon content. In choosing a range of higher K values, the Regional Board chose a range that assumes more is adsorbed rather than more being bioavailable. Additionally, the Regional board states in the Staff Report that the studies that generated the partition coefficients they intend to use used an analytical method that “may cause partition coefficients to be overestimated”, which signifies an additional bias towards larger K values and lower freely dissolved pyrethroid concentrations. Both the calculation of the K values and the selection of K values will create data that would underestimate the bioavailable fraction of pyrethroids.

RESPONSE: The Staff Report (section 5.2.2.2) contains documentation of the rationale for selection the partition coefficients in the proposed Basin Plan Amendment. Independent scientific peer reviewers supported the use of these coefficients as appropriate.

The commenters are incorrect in stating that the studies that generated the portion coefficients used were from studies identified in the Staff Report as using a method that may cause partition coefficients to be overestimated. Partition coefficients from two studies that used a method that may cause partition coefficients to be overestimate were not used, precisely for that reason. The partition coefficients selected are from a study that was determined to be most accurate using criteria documented in the Staff Report. The partition coefficients in the proposed Basin Plan Amendment were not selected to be biased in any direction.

PCFFA & IFR Comment No. 9: The justification for using the bioavailability approach is lacking and the scientific basis behind it is minimal. This would be a novel approach. A detrimental monitoring procedure is a risky time to implement an unproven method. The calculation itself would additionally be a novel approach that the existing literature states should not be used for compliance monitoring. The bioavailability approach would be a low estimate of pesticide exposure and the freely dissolved fraction calculation used is clearly biased towards an underestimation of the bioavailable fraction. This approach would lead to an extreme underestimation of the actual exposure, which would be devastating to sensitive fish populations.

We request that the State Board denies the use of the unproven bioavailability approach and direct the regional board to regulate Pyrethroids correctly.

RESPONSE: See Response to PCFFA & IFR Comments No. 5, 6, 7 and 8. As noted in these previous responses, the independent scientific peer reviewers supported the technical basis of the proposed bioavailability approach, including the use of the proposed partition coefficients.

PCFFA & IFR Comment No. 10: The current alternative is not protective of salmon and aquatic life. IFR and others are very concerned that the beneficial uses most impacted by Pyrethroid discharges are fisheries spawning and reproduction, and cold water fisheries. Despite this, the impacts to salmon are dismissed due to the fact that there are limited studies on impacts to salmon from Pyrethroids. The studies that do exists are peer reviewed and represent the best available science on this issue. We feel the existing studies should have been relied upon, instead they are dismissed. We are especially concerned that the studies were not included or addressed in the U.C. Davis peer review. We feel this is one of the major factors that led to the least protective alternative being chosen and this is unacceptable. More studies exist on impacts to fisheries from Pyrethroids than exist on bioavailability of pyrethroids, yet studies that support more protective approaches have been dismissed outright throughout this process.

RESPONSE: The proposed Basin Plan Amendment was developed to be protective of all aquatic life, including salmon, and was developed in consideration of all the scientific studies in the record as documented in the Staff Report and responses to comments.

All available studies were considered in the documents sent to peer review when the scientific basis for the proposed Basin Plan Amendment was sent to peer review in May 2015. While additional studies became available following this peer review, as

documented in the Staff Report and response to comments, none of these studies provided information showing that the concentration goals in the proposed Basin Plan Amendment would not be protective of aquatic life and fisheries. As described in Section 5.2.5 of the Staff Report, for pyrethroids, the acute lethality data for the most sensitive aquatic invertebrate species is lower than, or in one case¹ equal to, any quantified lethal or sublethal acute or chronic fish toxicity threshold. Available evidence indicates that invertebrates are the most sensitive organisms to pyrethroid and that criteria protective of invertebrates, such as the proposed concentration goals, will also be protective against potential impacts to fish. Therefore, protecting the aquatic life beneficial use will also be protective of fisheries spawning and reproduction.

The proposed Basin Plan Amendment also includes a commitment from the Central Valley Water Board to work with stakeholders to develop a Pyrethroid Research Plan within two years that will describe research and studies to inform future iterations of the control program. Toxic effects such as sub-lethal and chronic effects are the topics identified in the proposed Basin Plan Amendment that may be included in the Research Plan. All stakeholders, including the commenters, are encouraged to participate in that process to help ensure the data are developed to inform the Board in the implementation of the control program.

When new information becomes available in the future regarding the environmental effects of pyrethroids, this information will be considered by the Central Valley Water Board when the Board re-visits the pyrethroids control program, which the Board could initiate any time but has committed to doing no later than 15 years after the effective date of the Basin Plan amendment.

PCFFA & IFR Comment No. 11: The following quotes from the California Department of Fish and Wildlife support the need for more protective standards, as do the studies that the Fish and Wildlife Service submitted as part of this processes.

Response: The Central Valley Water Board has responded to these comments from the California Department of Fish and Wildlife (CDFW), and the commenter has not provided an explanation how their responses were inadequate. Nevertheless, Central Valley Water Board responses to the CDFW comments quoted are provided here for clarity. See response to PCFFA & IFR Comment No. 10 regarding consideration of the studies submitted.

PCFFA & IFR Comment No. 12 (Quoting CDFW March 2017 comments):

“The disruption of olfaction in salmonids by other pesticides has been shown to likely increase straying in Chinook salmon (Scholz et al. 2000). A high occurrence of straying of fall-run Chinook salmon occurs between the Sacramento and San Joaquin river basins. The analysis for the protection of endangered and threatened species does not appear to include the cumulative impacts of pyrethroid pesticides, alone and in combination of other stressors, on the chronic long-term direct impacts to endangered species, or the indirect impacts from the reduction of the quantity or quality of food. Predicting the response of different fish species to

¹ Chronic sublethal effects of the pyrethroid bifenthrin on inland silverside a fish that reside in the Delta, have been demonstrated at levels equal to the lethal toxicity values (LC₅₀) for *Hyaella azteca* (0.5) nanograms per liter. The chronic criteria for the bifenthrin used in the amendment are lower than this value.

contaminants requires considering the sensitivity and exposure of different life stages, the energy deficits due to multiple stressors, and the joint effects of temperature on metabolic rate and chemical elimination (Brooks et al. 2012)." (Response to Comments P. 25)

Response: The proposed control program will require significant reductions in pyrethroid levels in the Delta and its tributaries, which will improve water quality for salmonids in these watersheds. Chronic direct impacts have not been demonstrated on threatened and endangered species at levels below the proposed pyrethroid concentration goals, thus achieving the concentration goals is expected to be protective of these species. The concentration goals are also expected to be protective against indirect impacts on food sources because the proposed concentration goals are set at levels to be protective of the most sensitive tested aquatic invertebrate (*Hyalella azteca*).

PCFFA & IFR Comment No. 13: (Quoting CDFW March 2017 comments):

Brander et al. (2016) demonstrated clear reductions in egg fertilization for 0.5 ng/L bifenthrin exposures (approximately 30% reduction). As well, the study demonstrated that the likely mechanism for the reduced reproductive success, a trend in reduced choriogenin per total protein content, started at fish exposures to 0.5 ng/L bifenthrin. The report is unclear how Staff concluded that effects were not linked to reproduction and not included in the criteria derivation. This study is an additional line of evidence that the 5th percentile criteria goal is not protective of supporting aquatic life beneficial uses. (Response to Comments p. 26)

Response: Clarification was also added regarding why this effect level was not included in criteria derivation – this effect is clearly linked to reproduction, but the study was published after the pyrethroid criteria reports were updated in 2015 and that is why it was not included. These data would have been used in chronic criterion derivation for bifenthrin if they were available at the time of the update, but it is unlikely that they would have altered the chronic criterion because the toxicity value is above the UC Davis 5th percentile chronic criterion of 0.1 ng/L.

PCFFA & IFR Comment No. 14: (Quoting Central Valley Water Board Responses to comments): *"The quantifiable impact of pyrethroids on declines in mysid shrimp populations, fish populations, or reductions in food sources for fish are not available."* (Response to Comments p. 20)

Response: This quote was from the Central Valley Water Board's response to a CDFW comment. The entire response to the comment reads as follows: *"The 5th percentile concentration goals are below the mysid toxicity values, thus ambient concentrations equal to the pyrethroid concentration goals are expected to be reasonably protective of mysids. The quantifiable impact of pyrethroids on declines in mysid shrimp populations, fish populations, or reductions in food sources for fish are not available. The 2.5 percentile criteria were not reviewed in the peer review, but that does not change the peer reviewers' conclusions regarding the 5th percentile concentration goals as being reasonably protective."*

PCFFA & IFR Comment No. 15: We are very concerned that historic sediment pollution, currently occurring pyrethroid sediment pollution, and cumulative impacts have been ignored throughout this process and that sediment standards and sediment discharge prohibitions are not included in this process. Pyrethroids are not the only limiting factor for fisheries and many other water quality issues, life cycle impact how fish react to Pyrethroid toxicity. Fish are

exposed to sediments due to sediment mobilization during key life stages and through spawning, and other aquatic life is exposed to sediments through food sources. Pyrethroids are also discharged through sediment mobilization in storm events in agricultural areas, yet this plan does not include stormwater monitoring for agriculture or sediment control measures.

RESPONSE: The proposed Basin Plan Amendment was developed to address pyrethroid toxicity in the Sacramento and San Joaquin River Basins, including toxicity in sediments. As supported by analysis in the Staff Report, attainment of the concentration goals is expected to address most or all pyrethroid sediment toxicity. Criteria for pyrethroids in sediment were considered in developing the proposed Basin Plan Amendment, but as discussed in the Staff Report they were not recommended by staff because the state of science for sediment criteria is not as well established as it is for water quality criteria, and by continuing to interpret the narrative objectives, the Central Valley Water Board will have flexibility in changing the numeric evaluation guidelines if and when values with higher certainty are available. The proposed Basin Plan Amendment contains a prohibition for pyrethroids, but a sediment discharge prohibition was not incorporated into the proposed Basin Plan Amendment because it was not required to achieve the objectives of the initial phase of this phased control program. Prohibitions could be considered by the Board in future phases.

Attainment of the concentration goals would address the potential toxicity of pyrethroids, including toxicity resulting from pyrethroids that enter the water via mobilization of sediments or the exposures from food sources. The control program includes monitoring requirements for agriculture which would require sampling in agricultural areas during storm runoff events. It should also be noted that the Central Valley Water Board's Irrigated Lands Regulatory Program and Dairy Programs require all agricultural discharger to implement practices to control erosion. Finally, the proposed Basin Plan Amendment also includes sediment toxicity testing with the most sensitive test organism for pyrethroids, *Hyalella azteca*, which will provide an indication if pyrethroids are present at levels which contribute to sediment or water column toxicity.

PCFFA & IFR Comment No. 16: Furthermore fish can be severely impacted by acute exposure at very low levels of pyrethroid even if these levels are at less than the allowable detects."

RESPONSE: The concentration goals in the proposed Basin Plan Amendment only apply to quantifiable pyrethroids, because non-quantifiable concentrations were determined to not provide an adequate basis for determining exceedances of a regulatory trigger or numeric target. It is true that, due to current limitations in laboratory analytical chemistry methods, some concentrations that are detected but not quantifiable could impact fish. However, as discussed in the Staff Report, Central Valley Water Board is committed to working towards improved laboratory methods in implementing the control program. As mentioned previously, the proposed Basin Plan Amendment also includes toxicity testing with the most sensitive test organism for pyrethroids, *Hyalella azteca*, which will provide some indication if pyrethroids are present at levels which are toxic, even in cases where the concentrations are not detectable or quantifiable.

PCFFA & IFR Comment No. 17: These comments just outline our main concerns with this amendment and address the areas where we feel our comments were not taken into account or addressed. We request that the State Board directs the Regional Board to regulate whole water concentrations of Pyrethroids, abandon the controversial and unproven bioavailability approach,

adapt standards and monitoring requirements for stormwater and agricultural discharges, and address the issues of Pyrethroid toxicity in sediments. The fate of the Delta and our industries depend on this decision.

RESPONSE: Comment acknowledged. See responses to PCFFA comments # 1-15 above.

The following April 2017 comments from the Institute for Fisheries Resources, the Pacific Coast Federation of Fishermen's Association, San Francisco Baykeeper, Pesticide Action Network North America, Environmental Justice Coalition for Water and the California Sportfishing Protection Alliance were resubmitted with the November 2, 2017 comment letter from PCFFA & IFR. The original responses to those comments have been reproduced or summarized below each comment for clarity.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 1: Pyrethroids are known to have high toxicity and significant impacts to aquatic food chains. We are concerned that nearly all samples taken so far that tested positive for pyrethroids showed major exceedances, which most likely means that fisheries are already being impacted by these highly toxic chemicals. The Basin Plan states that no individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses, and that discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses. It is apparent to us that pyrethroid discharges are resulting in both, in violation of the Plan.

RESPONSE: The pyrethroids control program and TMDLs are being developed because there have been documented cases of toxicity caused by pyrethroids. The goal of the control program and TMDLs is to reduce pyrethroids levels to concentrations that provide reasonable protection of beneficial uses.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 2: IFR represents commercial fishermen who have faced extremely restrictive salmon seasons many years within the last twenty years, therefore the state the San Joaquin and Sacramento River are of economic importance to our industry and all the other industries and communities we support. The Sacramento River Fall Chinook ocean abundance projection declined from 652,000 in 2015 to around 300,000 in 2016. The number of salmon-permitted vessels has declined from approximately 5000 in 1980 to approximately 1100 today. In 2015, only 585 vessels actually landed salmon in California. Fisheries and fishery-dependent coastal communities are suffering through back-to-back resource crises, with a poor salmon season in 2015, and 2016, loss of half of the crab season, and the prospect of another poor salmon season this year. Sacramento Fall chinook are not overfished. Their abundance declines are due to declines in river productivity, which in turn are caused by reduced flows, habitat degradation, the presence of toxic chemical species at mutagenic and lethal concentrations, and many other factors.

RESPONSE: The Board recognizes the difficulties facing commercial fishermen and coastal communities. The Board's expectation is that the proposed Basin Plan Amendments will help ameliorate certain water quality impacts associated with pyrethroid pesticides and will assist in the recovery of fisheries dependent on water quality in the Central Valley.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 3: Fishermen bear the financial burdens of these impacts, which in many cases occur in contravention of the law, past settlements, and management plans. Pyrethroid discharges are no exception. We are especially

concerned with the cumulative impacts of pyrethroid pesticides with other chemicals that are entering the watershed such as diazinon and chlorpyrifos, and with other water quality pollutants such as selenium, nitrates, salts, temperatures, poor pH, and phosphates. We have requested that an analysis of the cumulative effects of introduction of these various chemicals on water quality be included in the basin amendment documents, however this request seems to have been ignored. This is unacceptable.

RESPONSE: See response to PCFFA & IFR Comment No. 3.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 4: We have also advocated for a zero allocation of pyrethroids, pyrethroid sediments concentration standards, and a robust sampling and monitoring program as part of this process. We are disappointed with the recommendation of the UC Davis 5th percentile standard, which is not protective of the WARM and COLD beneficial uses. The Staff Report lays out the reasoning for at least the UC Davis 1st percentile standards for the water column and numeric standards due to the lack of monitoring data in non-listed watersheds, major exceedances where samples have been taken, already occurring bioaccumulation, genetic mutation of *Hyaella azteca*, and temperature impacts to toxicity. While the issues outlined in the Staff Report support the adoption of stringent standards, the staff uses uncertainties to justify less protective alternative and even not regulating the agriculture industry as part of this TMDL.

RESPONSE: The best available science was used to conclude that the pyrethroid concentration goals based on the 5th percentile UC Davis criteria would be protective of beneficial uses and consistent with attainment of water quality standards. This conclusion was supported by the external peer review and two of three peer reviewers stated that the 5th percentile values would be protective of aquatic life and that the 1st percentile values are likely overly conservative. The 5th percentile values are also consistent with the level of protection recommended in USEPA criteria derivation guidelines (USEPA, 1985). The 5th percentile chronic concentration goals are lower than, or, in one case, at the LC₅₀ for *Hyaella azteca*, indicating reasonable protection for even the most sensitive identified species.

The proposed Basin Plan Amendment also includes toxicity testing, which will provide information on the potential additive and synergistic impacts of pyrethroids in combination with other stressors and the overall level of protection being attained. This additional information is expected to reduce the scientific uncertainty associated with the recommended approach.

As discussed in the Staff Report, a zero allocation for pyrethroids would not be reasonable as long as pyrethroids remain registered for widespread use as it would require cessation or an unfeasible level of treatment of all MS4 and POTW discharges and either cessation or an infeasible level of treatment for agricultural discharges or cessation agricultural pyrethroid uses. Also, as discussed in the Staff Report, overly stringent concentration goals could result in unintended environmental impacts from other pesticides (e.g., replacement products). The proposed Basin Plan Amendment will require robust monitoring by agricultural, wastewater and municipal storm water dischargers. The proposed Basin Plan Amendment includes significant requirements for agricultural dischargers. Agricultural discharges are not proposed to be regulated under TMDLs because they are already regulated under the Irrigated Lands Regulatory Program, and adopting TMDLs would not provide meaningfully different regulatory requirements on these discharges.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 5: The proposed concentration goals/targets are above levels of lethality for aquatic organisms such as *Hyalella azteca* and fail to account for increased toxicity of pyrethroids at low temperatures, and increased toxicity due to the numerous pesticides and other chemicals discharged into the estuary and its tributaries in the Central Valley, along with additive effects from multiple pyrethroids. The proposed concentration targets also allow increased concentrations of pyrethroids by assuming most of them are not "bioavailable", but this assumption is unproven in the field and the factors used to make this calculation are known to vary greatly, increasing the likelihood that there will be toxic impacts allowed by the board under the proposed concentration targets. The use of the bioavailable standard is also not protective of sediments which are likely to be mobilized when pyrethroids are most toxic in cool water months. This is the period when many species are emerging from eggs and larval stages, maximizing somatic growth and preparing for outmigration.

RESPONSE: See response to PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 4.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 6: The adoption of basin-wide TMDL standards is the most suitable option for the conservation of fish according to Basin Plan requirements, however the compliance schedule should apply immediately to anything but WWTP. Numeric triggers and management actions could be used. We support Alternative 1 for all water bodies. The WARM and/or COLD beneficial use alternative is not viable as it does not deal with the [the fact that] WARM and COLD [water bodies] are receiving bodies to the unregulated waters. We do not support the proposed alternative as it allows the board to decide which water bodies can have unregulated discharges using a heretofore undefined rubric.

RESPONSE: The rationale for the proposed regulatory approach is described in the Staff Report. A Basin-Wide TMDL was considered but ultimately not recommended as the regulatory alternative for the reasons specified in the Staff Report. As stated in the Staff Report, one of the main goals of the proposed control program is the protection of beneficial uses. Accordingly, the regulatory approach proposed in the Staff Report appropriately focuses on water bodies with beneficial uses that are threatened by pyrethroids.

The regulatory approach in the control program in the proposed Basin Plan Amendment would utilize TMDLs, prohibitions, and other regulatory requirements to require the development and implementation of management plans to reduce pyrethroid pesticide discharges. The proposed Basin Plan Amendment would apply to all discharges to water bodies in the Sacramento/San Joaquin River Basins with WARM and/or COLD beneficial uses. It should be noted that nearly all natural water bodies in the Sacramento and San Joaquin River Basins have WARM and/or COLD designated uses. In addition, the Central Valley Water Board has the discretion and authority to address any water quality impairments that may be caused by upstream discharges to water bodies that do not have WARM and/or COLD beneficial uses.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 7: Given the highly impacted status of the Delta and its fish populations, and given the fact that pyrethroids are identified as a likely cause of that decline, the pyrethroids targets should be well below known toxicity thresholds to ensure pyrethroids are not contributing to the further decline of aquatic life and endangered fish in the Delta and that proposed concentration goals/targets are consistent with the Board's mandates and water quality objectives. The unknowns related to additive and

temperature impacts should not be dismissed, but lead the board to choose the most precautionary alternative.

RESPONSE: See response to PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 4.

The proposed concentration goal explicitly addresses the additive toxicity of the six main pyrethroids of concern, and the proposed Basin Plan Amendment also includes toxicity monitoring with the most sensitive known test species for pyrethroids to determine if other additive or synergistic effects are occurring. The proposed concentration goals will be a significant reduction in current concentrations and can be revised during the scheduled future evaluation as warranted.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 8 (Temperature and Flushing Impacts): The Staff Report states that the UC Davis 1st percentile is too protective. We strongly disagree with this conclusion. None of the alternatives deal with low temperature impacts, which greatly magnify pyrethroid toxicity and cumulative impacts to marine species. Furthermore, current flow processes aim to make water colder in important winter months to mimic natural spawning conditions. While these cold water flows are greatly needed, known increased cold water pyrethroid toxicity compromise their effectiveness in facilitating salmonid health. Extreme flood events and resulting unpredictable large discharges during winter months will likely occur in the future. Choosing an alternative that is barely protective if known pyrethroid toxicity is ignored will not lead to water quality objective attainment.

RESPONSE: The proposed concentration goals are expected to result in a significant reduction in current concentrations and these goals can be revised in the future, if necessary. The Board would expect these goals to be revised if additional information becomes available on the effects of lower temperatures on multiple species for pyrethroids. The proposed Basin Plan Amendment also includes toxicity monitoring with *Hyaella azteca*, which is the most sensitive test species for pyrethroids, to determine if other additive effects are occurring. Also see response to PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 4.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 9 (Impacts to *Hyaella azteca* and other aquatic species): The impacts of pyrethroids on endangered and commercial salmon species are of grave concern to fishermen, who are dealing with the economic consequences of the ecological decline of the Delta. Pyrethroids have sublethal impacts on salmon and on species that filter water from contaminants that impact salmon. Salmon exposed to sediments and not just the water column including during their most susceptible points of lifecycle. While the impacts to local salmon are not well documented, studies of other Delta species, and salmon in other areas give us an indication of ways that salmon are being impacted by high concentrations of pyrethroids in the Sacramento and San Joaquin Rivers. Some of these studies point to the need to adopt more stringent standards due to the timings of exposure.

Furthermore genetic impacts and stressors in *Hyaella azteca* bring up some very important questions related to endangered species in the Delta. Studies related to genetically altered salmon have found that genetic disturbance to salmon species have the chance to cause serious decline in already struggling species, however the Staff Report rarely mentions fisheries impacts let alone genetic and cumulative impacts.

Another issue that point to the need for stringent standards from pyrethroids is the fact that they are likely traveling and concentrating into estuaries.

RESPONSE: Staff is not aware of any studies linking pyrethroid exposures to genetic alterations in fish. The presence of pyrethroids in estuaries is a key concern and a reason the Board has prioritized the development of the Pyrethroid Pesticide Control Program. Also see response to PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 4.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 10 (Water Quality Impacts):

We are very concerned that there is little to no discussion of cumulative watershed impacts within this SED despite the fact that studies from *Hyaella azteca* point to the fact that pyrethroid can cause genetic issues and other impacts that can leave species susceptible to other water quality stressors. There is no one answer to what is killing of the food web and salmon populations in the Bay Delta and its tributaries. This makes a discussion of cumulative impacts, and recommendations based on this discussion especially important. The fact that other highly toxic chemicals such as mercury and organochlorine are also stored in sediments and mobilized by the same events that mobilize pyrethroids also point to the need for a hard look at cumulative impacts in this process. Staff dismissed Cumulative Impacts in this SED and in their recommendations.

Additive Impact with other pyrethroids are discussed but not well accounted for and additive impacts with other pesticides, including the same ones that pyrethroids were meant to replace was not addressed. This is a serious issue as one would assume that they would impact the very same waters and sediments.

RESPONSE: See response to PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 3:

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 11 (Algae and Biomass): The fact that pyrethroids are impacting biomass and encouraging alga, which can be harmful to fish and humans needs to be addressed further.

RESPONSE: The potential for pyrethroids to impact biomass and/or encourage alga are significant concerns that were considered in the development of the proposed Basin Plan Amendment. The proposed concentration goals would be protective against impacts from these kinds of effects, since they are protective of even the most sensitive organisms, including the invertebrates that consume alga.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 12 (Sediments): For many of the reasons outlined above we support a goal of no pyrethroids in sediments and are extremely disappointed that not only is this option dismissed in this SED, but setting numeric standards for sediments is also dismissed. We understand that sediments already have accumulated pyrethroids, however this only supports the need for no new discharges especially when taken into account that additional toxins are present in sediments.

RESPONSE: The rationale for the elimination of the “no pyrethroids in sediments” alternative is described in the Staff Report. This alternative would simply be impossible for the Board and dischargers to achieve at this time, and could result in significant unintended consequences from alternative pesticides. For these reasons, it would not be

reasonable or feasible at this time to prohibit all discharges of pyrethroids, however it is appropriate to instigate a control program that leads to beneficial use protection.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 13 (Issues related to Bioavailability): We have concerns the that staff is suggesting not using actual pyrethroid concentrations in water samples to determine exceedances but instead want to use an undetermined method for accounting for bioavailability. This method involves estimating concentrations, and no evidence that this method is proven or exact is provided in the SED.

Furthermore using whole water standards is more protective of sediments. The fact that organisms can be impacted by interaction with sediments, through mobilization in storm events, and through food sources demonstrate that this method will not be as protective of beneficial uses.

RESPONSE: See response to PCFFA & IFR Comment No. 5.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 14 (Additive Toxicity): We are very concerned with additive toxicity from multiple pyrethroids. The fact that quantitative limits are not recommended to address additive toxicity, along with the fact that temperature impacts and cumulative impacts are not addressed and sediment numeric standards are not being adopted point to the fact that the more protective UC Davis 1st percentile standard should be adopted. It seems that anywhere issues that demonstrate the need to greatly protections are dismissed for lack of data, which leads to finding the less protective alternatives would meet water quality standards. However, this is a highly toxic chemical that has already could serious water quality impairments. Dismissing such serious issues should lead to the board to air on the side of caution.

RESPONSE: See response to PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 7.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 15 (Agriculture): We do not support the proposal that agricultural discharges be regulated through the Irrigated Lands program instead of a TMDL. This is of concern because often dischargers do not have a responsibility to monitor and report regularly, and there is no monitoring plan laid out in this document.

For instance, the general permit for dairy operations do not require monitoring for pesticides and orchards are still allowed to aerial spray pyrethroids, while in municipalities there are regulations on spraying.

We suggest that agriculture is regulated through TMDLs and more protective BMPs are required such as riparian buffers of 200 feet from any WARM or COLD waterway and 100 feet of any conveyance. No aerial spraying should be allowed at all. We also suggest that all applicators have to be certified and trained in HazMA protocol so that pyrethroids are not discharged through cleaning and storing or clothes and equipment.

How exceedance are detected and who is doing the monitoring, and when needs to be laid out for this effort to be effective. Do farmers do their own monitoring? Where are the samples processed Do they monitor in winter? Do they monitor in floods? How are we guaranteed this will happen? Monitoring at the wrong times can lead to lack of detecting exceedances.

RESPONSE: The proposed Basin Plan Amendment includes significant requirements for agricultural dischargers. As discussed in the Staff Report, agricultural discharges are not proposed to be regulated under TMDLs because they are already regulated under the Irrigated Lands Regulatory Program, and adopting TMDLs would not provide meaningfully different regulatory requirements for these discharges. The Board does not have authority to mandate the means of compliance with water quality objectives (Wat. Code, § 13360.), and therefore does not require specific management practices, such as those proposed by the commenter. Instead, the proposed Basin Plan Amendment would require the dischargers to determine how to best meet the concentration goals and submit a plan to that effect for Executive Officer approval.

The Board also cannot regulate pesticide use or requirements for applicators of pesticides, as that is within the exclusive jurisdiction of DPR and USEPA. Agricultural monitoring is performed by dischargers through the ILRP, which includes the development and implementation of appropriate monitoring and reporting programs for agricultural dischargers. Under the proposed Basin Plan Amendment agricultural dischargers, including dairies would be required to conduct monitoring adequate to meet the monitoring goals, and subject to Executive Officer approval. The Executive Officer's review would include assessing if monitoring would be conducted at the appropriate times and places and with adequate methods, to meet the proposed monitoring goals.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 16 (Coordination with other agencies): It is stated that municipalities do not have the ability to ban pesticides, yet pesticides with similar toxicity issues have either been banned or categorized in a way where they can only be used in certain situations by certified applicators. We suggest that the Central Valley and State Boards contact the EPA, DPR, and other agencies including wildlife agencies to establish protective regulations such as no application by the general public, riparian buffers, no application in the wet season or when summer storms are expected, application standards, HazMat type protocols for equipment, storage and clothing. If protect standards, prohibitions, and BMP are used than there is no reason to not be able to obtain a zero discharge standard in most water bodies.

RESPONSE: The Board cannot regulate pesticide use or requirements for applicators of pesticides, as that is within the exclusive jurisdiction of DPR and USEPA. Central Valley Water Board and State Board staff regularly coordinates with DPR on pyrethroids and other pesticide issues, and the proposed control program includes continued work with the State Board to coordinate with DPR and EPA to reduce pesticide water quality impacts. The Water Boards have also been involved in working with EPA on pyrethroids and will continue to work with EPA to request that water quality, particularly for California conditions, is considered when pesticides are reviewed or considered for considered for approval. However, as long as pyrethroids are used in the Sacramento and San Joaquin River Basins, achieving zero discharge of pyrethroids will not be reasonably attainable, thus the proposed concentration goals are aimed at providing reasonable protection of beneficial uses.

PCFFA & IFR et al. APRIL COMMENT LETTER Comment No. 17 (Alternatives): We wish to state again that the 5th percentile threshold is not protective enough as it does not account for the up to 3 fold toxicity during cold temperatures, sediment movement, cumulative impacts, uncontrolled discharges in flood events, and additive toxicity. It is only if their important issues are not accounted for that the proposed standard can claim to be protective.

We also do not agree with the dropping of the no concentrations in sediments goal. Dismissing this goal because it is hard to regulate pyrethroids is not justified as the goal is achievable.

While controlling pyrethroid discharges may be difficult and involve coordination with other agencies it is in fact possible, and the EPA and NOAA fisheries have opportunities, to engage in processes that can help achieve this goal currently. The alternative is feasible under this type of coordination.

Last we recommend the most protective monitoring program be implemented and that monitoring in areas where pyrethroid use is suspected begin immediately.

RESPONSE: See response to PCFFA&IFR et al. APRIL COMMENT LETTER Comment No. 4 regarding the proposed concentration goals and the no concentrations targets.

The proposed Basin Plan Amendment includes coordination with DPR and EPA, but the Board cannot be certain as to what actions they will take. Their regulatory actions will be a consideration in future Board evaluations of the control program and when the Board considers potential numeric water quality objectives for pyrethroids.

The proposed Basin Plan Amendment would result in a significant increase in pyrethroid monitoring in areas where they are greatest concern within the first two years of the program. It should also be noted that relevant monitoring is also ongoing through the Delta Regional Monitoring Program, the Boards Surface Water Ambient Monitoring Program, DPR monitoring, and Irrigated Lands and Storm Water and Wastewater programs.

4. SACRAMENTO REGIONAL COUNTY SANITATION DISTRICT (REGIONAL SAN)

Comment letter was received by the State Water Board on November 2, 2017.

REGIONAL SAN Comment No. 1: We strongly support the Central Valley Regional Water Quality Control Board's (Regional Water Board's) use of stakeholder processes in developing Basin Plan Amendments. We believe this type of process allows the various stakeholders to work collaboratively with regulatory agencies in achieving technically and scientifically sound standards and policies. The ability to express concerns early in the basin planning process and work through issues, results in an effective Basin Plan Amendment (BPA) that meets the requirements of water code, and that can be practically and feasibly implemented to protect beneficial uses.

RESPONSE: Support noted.

REGIONAL SAN Comment No. 1: Regional San raised our following comments in a March 24, 2017 comment letter on the BPA, and as oral comments at the June 8, 2017 Regional Water Board meeting. Regional San is supportive of the use of the fifth percentile for establishing the criteria, the use of the bioavailable portion of pyrethroids for determining trigger exceedances, and the last minute addition of working with stakeholders to develop a Pyrethroid Research Plan (Research Plan) within two years from the Office of Administrative Law approval date of the BPA."

RESPONSE: Support noted.

REGIONAL SAN Comment No. 2: Regional San strongly supports including inter-laboratory comparison for chemistry and toxicity test method development. We also support that the Executive Officer when evaluating the toxicity test and analytical methods, considers Environmental Laboratory Accreditation Program accreditation, associated quality assurance and quality control provisions, scientifically peer reviewed methods, and results of inter-laboratory comparison studies.”

RESPONSE: Support noted.

REGIONAL SAN Comment No. 3: Regional San also commented in our March, 24, 2017 letter that the calculation to determine whether numeric triggers are exceeded by wastewater treatment plants should be based on ambient water quality data, not effluent data. The Regional Water Board’s response in General Comment No. 2, page 5, in Response to Comments states:

“Establishing this link is comparatively straightforward when applying the prohibition to the discharge as opposed to receiving waters.” and,

“Though the prohibition would legally apply at the discharge for all discharge categories, monitoring requirements to detect trigger exceedances will differ for some discharge categories based on practical considerations.”

Simply because wastewater treatment plants have a discrete sampling point and it is practical to sample should not be the reason to apply end of pipe compliance when other regulatory programs are allowed to use ambient water quality data for determining compliance. The numeric triggers are related to potential impacts to beneficial uses in receiving waters, not at the end of pipe. Therefore, the calculation of whether numeric triggers are exceeded should be based on ambient water quality data, not effluent. This is especially important for wastewater treatment plants that have mixing zones and/or dilution, such as Regional San.

RESPONSE: See response to CVCWA & CASA comment No 1.

It is true that one of the goals of the control program is to establish pyrethroid concentration goals that provide reasonable protection of beneficial uses in receiving waters. As discussed in the Staff Report, nine different regulatory approaches for pyrethroids were considered in the public process, and a prohibition of discharge was the regulatory approach that was recommended by Regional Board staff and stakeholders. Adopting water quality objectives, which would legally apply in the receiving waters, was not the recommended approach because of a number of factors, as described in the Staff Report, including insufficient information to analyze attainability of objectives and the economic costs of attainment in accordance with Water Code section 13241. In contrast, Water Code section 13243, the legal basis for the conditional prohibition in this Basin Plan Amendment, expressly authorizes the Regional Board to adopt a prohibition on certain “discharge[s] of waste.”

The prohibition would legally apply at the discharge for all discharger categories. The purpose of the prohibition of discharge is to work towards attainment of the trigger in the discharge for all categories. The Central Valley Water Board has found that representative receiving water monitoring is generally appropriate to represent the discharge from stormwater and irrigated agriculture because their discharges of pyrethroids are too geographically diffuse for individual outfall- or field-level monitoring to be practicable. The monitoring under these programs in the proposed Basin Plan

Amendment, therefore, uses representative receiving water to represent the collective discharges from municipal stormwater and wastewater discharges, and not to represent some further downstream ambient condition where the discharge may have been diluted. Therefore, it would not make sense to allow wastewater dischargers to use ambient water quality data for determining compliance with the prohibition triggers, as the best representative monitoring for wastewater discharges is in the effluent. The monitoring is different for stormwater and agriculture vs. wastewater for practical reasons, but the overall objective is the same – attainment of the triggers in the discharge.

Additionally, the proposed Basin Plan Amendment language states that in reviewing management plans, the Executive Officer shall consider the potential impact of the pyrethroid discharge and whether the actions proposed are commensurate with the potential impact. Therefore, in cases where there is dilution and therefore lesser risks to aquatic life from benchmark exceedances in a discharge, the needed activities under a management plan can be adjusted accordingly and the discharger would be in compliance with the prohibition as long as they were implementing the management plan.

5. PYRETHROID WORKING GROUP (PWG)

Comment letter, submitted by Theresa Dunham of Somach Simmons and Dunn on behalf of the Pyrethroid Working Group, was received by the State Water Board on November 2, 2017.

PWG Comment No. 1: In general the PWG submits this letter in support of the Central Valley Water Board's actions and encourages the State Water Board to approve the Pyrethroid Amendment as adopted by the Central Valley Water Board.

RESPONSE: Support noted.

PWG Comment No. 2: The PWG has been an active participant in the Central Valley Water Board's process for developing the Pyrethroid Amendment. As an active participant, the PWG has provided Central Valley Water Board staff with significant data and information that has been developed over a number of years using state-of-the-art technology and laboratory standards. For example, the PWG has measured sediment adsorption coefficients for pyrethroids using Solid Phase Micro Extraction (SPME) techniques that build on approaches and data published by scientists at the University of California Riverside to provide the best-available data for the calculation of freely-dissolved (i.e. bioavailable) fraction of pyrethroid present in natural waters. These data have been used by Central Valley Water Board staff to calculate partitioning coefficients for the Pyrethroid Amendment.

RESPONSE: Comment noted.

PWG Comment No. 3: The PWG also submitted a robust Sensitive Species Distribution (SSD) that allowed for the calculation of potential acute criteria for the six pesticides named in the Pyrethroid Amendment. The Central Valley Water Board staff considered the PWG criteria as one of 12 alternatives evaluated in the Staff Report. However, the PWG criteria were rejected because Central Valley Water Board Staff Report alleged that they were arguable not protective of aquatic life beneficial uses. The PWG disagrees with this characterization of the criteria that were calculated from the PWG's SSD. The PWG approach is sound, and is based on an extensive set of toxicity data. The combined pyrethroid SSD submitted by the PWG provides a

more taxonomically representative and statistically robust basis for risk characterization than data used for the most sensitive single species, or SSDs based on data for a single pyrethroid alone, and are especially useful for pyrethroids that have been tested with small number of species"

RESPONSE: As discussed in the Staff Report, section A.5, deriving criteria based on the fifth percentile from the combined Species Sensitivity Distribution (SSD) submitted by the PWG does not provide chronic criteria and would result in acute values that are not protective of several known species. Therefore, it was determined this approach may not provide adequate protection for aquatic life beneficial uses. While the combined SSD may have utility for risk assessments or elsewhere, the commenter has not provided a description of how water quality criteria based on PWG SSD criteria would be protective of aquatic life or why the conclusions in the Staff Report regarding the PWG SSD as water quality criteria were not correct.

PWG Comment No. 4: Regardless of the fact that the PWG SSD and calculated criteria from the SSD were not adopted by the Central Valley Water Board, the PG remains supportive of the Central Valley Water Board action as it considered numerous alternatives and ultimately selected one that was reasonable as compared to other more conservative options. Further, the PWG remains supportive because the water quality criteria selected by the Central Valley Water Board are used as triggering mechanisms rather than as water quality objectives or as values that interpret narrative water quality objectives. By selecting fifth (5th) percentile criteria (discussed further below) and by putting them into proper context, the PWG finds the Central Valley Water Board action to be reasonable under the circumstances."

RESPONSE: Support noted.

PWG Comment No. 5: A central component of the Pyrethroid Amendment is the inclusion of numeric triggers for pyrethroid pesticides in the implementation provisions, rather than the adoption of water quality objectives for pyrethroids. The PWG supports this approach for a variety of reasons. Most importantly, as articulated in Provision 16 of Resolution RS-2017-0057, there is insufficient information available for the Central Valley Water Board to properly consider the factors established by Water Code section 13241. Before adopting any water quality objective, the Central Valley Water Board is required to consider the factors specified in Water Code section 13241. In the absence of information necessary to consider these factors, it is inappropriate for the Central Valley Water Board to adopt water quality objectives. Thus, rather than adopting improper water quality objectives, the Central Valley Water Board is proposing to use numeric values to "trigger" the need for further management actions. Through the implementation of management actions and further monitoring, additional information will be obtained to inform future evaluations. From there, the Central Valley Water Board may then have sufficient information in the future to determine what are proper water quality objectives to reasonably support beneficial uses. In the meantime, the PWG supports the Central Valley Water Board's approach of using numeric triggers.

RESPONSE: Support noted.

PWG Comment No. 6: Contrary to the statements of others, the Central Valley Water Board's use of 5th percentile values for the pyrethroid concentration goals, which are then used in the calculation of the acute and chronic numeric triggers, are protective of aquatic life beneficial uses and are properly used in the Pyrethroid Amendment. These values are very conservative (and we would argue that they are overly conservative) in that they include many conservative

assumptions, including the use of considerably shorter averaging periods, and are based on exceedance frequencies of no more than once in every three years. Further, a safety factor of 2 is applied in the derivation of these criteria, and these values provide for protection for all but a small portion of taxa.

In contrast, others argue that the Central Valley Water Board should have adopted values based on the 1st or the 2.5th percentiles. With respect to the 1st percentile, the University of California Davis (UCD) *Methodology for Derivation of Pesticide Water Quality Criteria for the Protection of Aquatic Life in the Sacramento and San Joaquin River Basins* (UCD Pesticide Criteria Methodology) recommends that criteria be adjusted downward to the 1st percentile if data shows that toxicity can occur at lower concentrations than criteria derived from the 5th percentile. Following this methodology, Central Valley Water Board staff updated UCD 2010/2011 criteria for certain pyrethroid pesticides with new data and information, and then adjusted the criteria downward due to the sensitivity of laboratory strains of *Hyalomma azteca*². The alternative for the 2.5th percentile was presented merely as an option for something between the 5th percentile and the 1st percentile.

The Central Valley Water Board properly adopted the 5th percentile values for use in the concentration goal calculations, rather than the 1st or 2.5th alternatives, for several reasons. First, the 5th percentile values are appropriate, as they are inherently conservative and consistent with U.S. EPA's *Guidelines for Deriving Numerical Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*. Second, two of three peer reviewers noted that the 1st percentile values were overly conservative and that the 5th percentile values were protective. Third, the Central Valley Water Board is looking to reasonably protect beneficial uses (i.e., aquatic life beneficial uses) - not protect one single, sensitive species. For these reasons and others as expressed in our March 24, 2017 letter, the PWG supports the use of 5th percentile values for pyrethroid concentration goals at this time. As additional information becomes available, the PWG believes that it will be important to further evaluate these values to determine whether they are reasonably necessary to protect aquatic life beneficial uses.

RESPONSE: Support noted. The concentration goals were determined to be protective of aquatic life and are believed to be adequately protective all taxa, as they are reasonably protective of even the most sensitive species, *Hyalomma azteca*.

PWG Comment No. 7: Next, the Pyrethroid Amendment allows for the use of freely dissolved (i.e., bioavailable) concentrations of pyrethroids to determine whether numeric triggers have been exceeded. This is an essential consideration, given that pyrethroids are highly hydrophobic and bind tightly to suspended solids and organic matter, and it is the freely dissolved (and hence bioavailable) fraction of the chemical that is available for adsorption through gills and skin by aquatic organisms (i.e., the portion not bound to solids and organic matter). Use of the freely dissolved concentration (calculated using the best available science adsorption coefficients) is an appropriate predictor of bioavailability for pyrethroids because it is highly correlated with the bioavailable fraction. (See Final Staff Report, p. 58.) Accordingly, the PWG supports the Central Valley Water Board's use of freely dissolved concentrations and encourages State Water Board approval.

RESPONSE: Support noted.

² See, e.g., Water Quality Criteria Report for Bifenthrin, Updated Report. Prepared by Tessa Fojut, Ph.D. Central Valley Regional Water Quality Control Board, Updated May 2015.

PWG Comment No. 7: With respect to the development of the Pyrethroid Amendment as a whole, the Central Valley Water Board conducted an open, fair and transparent process that spanned several years. Stakeholder meetings were scheduled and noticed for all interested persons, and all stakeholders were given multiple opportunities to comment on administrative draft versions of proposed Basin Plan Amendments. Central Valley Water Board staff were open to varying viewpoints and considered data and information provided by all stakeholders. In fact, the Final Staff Report is replete with references to data and information provided by stakeholders, including the PWG. Overall, the PWG believes that this process has led to the development of a scientifically robust and reasonable Basin Plan amendment that should be approved by the State Water Board.

RESPONSE: Support noted.

6. DONALD WESTON, UNIVERSITY OF CALIFORNIA BERKELEY

Comment letter written by Donald Weston was received by the State Water Board on November 2, 2017.

Weston Comment No. 1: Some aspects of the currently proposed Region 5 Basin Plan amendment and associated Staff Report incorporate that best scientific information, with the presumption of pyrethroid additivity being an example.

RESPONSE: Support for the presumption of additivity acknowledged.

Weston Comment No. 2 (Quantification and regulation of only the bioavailable fraction): Conceptually, incorporation of bioavailability into a regulatory framework is a desirable goal. It has been a topic of very active research of my own, and of many other investigators. But unfortunately, a proven, generally accepted methodology ready for regulatory application does not yet exist. The Basin Plan employs an approach based on equilibrium partitioning theory, a potentially reasonable approach worthy of further investigation in a research context, but a frightening one in a regulatory context. I cannot over-emphasize the uniqueness of Region 5's proposed regulatory use of this approach. To the best of my knowledge, it has not been applied in a Regulatory context anywhere else at the state level, the federal level, or internationally. (Bioavailability has been used in South San Francisco Bay, but through an entirely different mechanism relevant only to metals.) There is a reason for its absence, and that is because no other environmental management organization has considered the approach sufficiently validated for regulatory purposes. I commend the staff for recognizing bioavailability issues, but the approach they propose has not been sufficiently tested.

A consequence of the staffs approach is that approximately 90% of the pyrethroid in a given discharge becomes unregulated. If the material is bound to particles or associated with dissolved organic matter, it is viewed as toxicologically irrelevant and not subject to any regulatory limitation. There are many concerns with such an assumption (e.g., the potential for subsequent particle desorption of the pyrethroid, the potential for bioavailability upon particle ingestion, the incorporation of the pyrethroid-laden particle in bed sediments and exposure to benthic organisms). One has to wonder if regulation of only the dissolved "bioavailable" fraction is appropriate, as argued in the Staff Report, then why is it not used for any other contaminants with comparable chemical characteristics? Organochlorine pesticides like DDT, many of the PCBs, many of the polynuclear aromatic hydrocarbons all would seem to "benefit" from the same regulatory approach, yet it has been used with none of them. If the Board is going to adopt the proposed Basin Plan amendment and accept the arguments in the related

documents, it must answer why pyrethroids merit regulation in such a way that the majority of the material discharged is ignored, when the approach has never been used for any other substance?

RESPONSE: Conceptual support for the incorporation of bioavailability noted. It is true that this would be the first time bioavailability calculations have been included in the regulation of pesticide dischargers. Please see the response to PCFFA & IFR Comment No. 5 regarding the fact that this approach has not been used before.

Bioavailability is routinely accounted for in regulation of discharges of other pollutants such as metals whose criteria include adjustments for water hardness. This amendment is the first time regulation of pyrethroid discharges has been established at this scope and scale. The chemical and toxicological properties of pyrethroids, indicate that not accounting for bioavailability would likely over estimate potential toxicity, so targets based on total concentrations would likely be over-protective.

While this control program utilizes freely dissolved concentrations to assess attainment, their use does not mean that pyrethroids bound to sediment or organic matter would be “unregulated”, since a fraction of those pyrethroids that are bound will partition into the freely dissolved form, and that fraction would need to be below the concentration goals.

The challenges in their control and potential large reductions needed, and the potential environmental and economic impacts from over-protective regulation of pyrethroids (including potential impacts of alternative insecticides) warrant the Board take a balanced approach in their regulation. For these reasons the bioavailability approach in the proposed Basin Plan Amendment is merited, and this is consistent with how numerous other constituents are regulated.

Weston Comment No 3: I have raised this issue [concerns the bioavailability approach] with many times in hearings in Region 5 and in my comments to earlier drafts of the Staff Report. The staff’s response to the comment has basically been that the approach represents the best available science and the independent peer reviewers raised no objections. The former argument is simply an unsupported opinion. As to the latter response, comments warning against use of the bioavailability approach were received from EPA, California Department of Fish and Wildlife, environmental and fisheries groups, and myself. The wide array of groups and individuals voicing substantial concerns, all on the same topic, should carry at least as much weight as the three peer reviewers, and give the State Water Board pause before supporting such a dramatic departure from regulatory norms.

RESPONSE: The Staff Report contains the scientific information and references supporting the proposed Basin Plan Amendment, and supporting that the approach is based on the best available science. The independent peer reviews confirmed this basis was appropriate. Central Valley Water Board has responded to comments from USEPA, CDFW, environmental and fisheries groups, and the commenter including comments on their concerns with bioavailability approach. The final decision to use the bioavailability approach in the proposed Basin Plan Amendment was done in consideration of all the scientific and other information received.

In order to help resolve remaining uncertainties, including those brought up by these commenters regarding the bioavailability approach, the proposed Basin Plan Amendment also includes a commitment from the Central Valley Water Board to work

with stakeholders to develop a Pyrethroid Research Plan within two years that will describe research and studies to inform future iterations of the control program. Potential refinement of portion coefficients is one of the topics identified in the proposed Basin Plan Amendment that may be included in the Research Plan. All stakeholders, including the commenters, are encouraged to participate in that process to help ensure the data are developed to inform the Board in the implementation of the control program.

When new information becomes available in the future regarding the environmental effects of pyrethroids, this information will be considered by the Central Valley Water Board when the Board re-visits the pyrethroids control program, which the Board could imitate any time but has committed to doing no later than 15 years after the effective date of the Basin Plan amendment.

WESTON Comment No. 4 (Selection of partitioning coefficients): Use of the bioavailability approach requires the use of coefficients that predict how the total pyrethroid mass is distributed among the particle-adsorbed fraction, that associated with dissolved organic matter, and that which is freely dissolved. As it is not realistic to expect discharges to measure these coefficients in every sample, generic default values are provided in the Staff Report. In an earlier draft, an average of multiple coefficients for each pyrethroid was used, as obtained from the publications of Jay Gan and his students (UC Riverside). In the final Staff Report the staff decided the Gan values did not meet all data acceptability criteria, and chose to use a single measurement for each pyrethroid, derived from an unpublished study funded by the pyrethroid registrants.

The single value provided by the registrants was based on how pyrethroids partitioned between water and sediment in a pond in Massachusetts. Their study did not examine how variable the coefficients may be from one site to the next, or even at a single site from one season to the next. The work provided no assurance that the single value from the Massachusetts pond was applicable to California or anywhere else beyond that pond. Particles and associated organic matter vary enormously in quality and quantity from site to site, and to assume one measurement is applicable to every creek, river, stormwater sample, effluent discharge, and agricultural drain in California is frankly, laughable. Certainly any default value, whether that from the registrants or elsewhere, is unlikely to accurately represent site-specific partition coefficients in any given sample. Using a single default value in a regulatory context to determine compliance is akin to assuming every person in a large and diverse population weighs 150 pounds, and then penalizing them if they don't. While 150 pounds may be the "best" answer in that it is the single number that describes the most people, there would certainly be many individuals for which the estimate is wholly inappropriate and not remotely accurate.

In their response to comments, staff argue that the registrants' coefficient is the best data available, which even if true, does not make a single value adequate for the purpose employed. They also argue that the registrants' value falls near the midpoint of the range of the abandoned data from Jay Gan. While that may also be true, the Gan data is our only indication of how variable coefficients can be from sample to sample, and the variation he documented is huge. For the pyrethroid bifenthrin, his Koc estimates ranged from 98,000 to over 11,000,000 (the registrants' value is 4,228,000), and Kdoc ranged from 180,000 to 43,440,000 (the registrants' value is 1,737,127). While staffs assertion that the value they chose is near the mid-point of the range is correct, it ignores the enormity of the range! Application of the proposed approach requires plugging into an equation a single default G_v value (when the actual site-specific value appears likely to range over at least a factor of 100) and a single default Kdoc value (which appears likely to range over at least a factor of at least 240), and then attempting to enforce the dubious finding that if the calculated result coming out of the equation is a 1, you pass, and if it

is a 2, you are in violation. It defies belief to think that such an approach is not wide open to challenge by any discharger.

RESPONSE: See response to PCFFA & IFR Comment No. 7 regarding variability in the partition coefficients and representativeness of the coefficients in the proposed Basin Plan Amendment. In regards to the partition coefficients selected, the rationale for the selection of the partition coefficients used has been provided in the Staff Report and the commenter has not provided a reason why this rationale was not correct or appropriate. While it is true the default partition coefficients in the proposed Basin Plan Amendment were from a pond in Massachusetts, as discussed in the Staff Report, these coefficients were generally similar and fell within the range of coefficients derived in other studies, including studies using California sediments, indicating they would be applicable for waterbodies in California.

The Staff Report acknowledges the potential variability of partition coefficients. It should be noted however, that accounting for bioavailability improves the overall estimation of the toxic potential of a water sample, as not accounting for bioavailability will likely always overestimate the potential toxicity pyrethroids the sample. As discussed in the response to Weston Comment No. 2, potential refinement of partition coefficients or development of site specific coefficients is a topic that may be included in the Pyrethroid Research Plan, and the control program can be adjusted if improved coefficients are later developed.

WESTON Comment No. 5 (Concentration goals relative to toxicity thresholds): The Staff Report provides both acute and chronic pyrethroid concentration goals that dischargers are expected to meet. All goals are close to or exceed known 96-h LC50s for the amphipod, *Hyalella azteca*. In the case of the acute goals, for five of the six pyrethroids the goal exceeds the LC50 (that is, more than half the test animals would be expected to die in a toxicity test of water that meets acceptable limits for pyrethroids). In the case of the chronic goals, the goal for one of the pyrethroids is exactly at the LC50 (that is, half the test animals would die in a sample that meets acceptable limits), and three of the remaining five pyrethroids have goals that are only slightly below the LC50 [about one-third to one-half the LC50].

Adoption of the Basin Plan amendment and associated Staff Report is not consistent with the level of protection for aquatic life that the State Water Board has historically provided. The Basin Plan's narrative objective for toxicity states: "All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant animal, or aquatic life". The Implementation chapter of the Basin Plan states: "Where valid testing has developed 96 hour LC50 values for aquatic organisms, the Board will consider one tenth of this value for the most sensitive species tested as the upper limit [daily maximum] for the protection of aquatic life". The proposed concentration goals meet neither of these policies, and in fact, they promote policies that by definition release substances at concentrations expected to cause toxicity. The State Water Board should carefully consider the consequences of departure from long-standing practices, solely in the instance of pyrethroids.

The proposed concentration goals provide a very marginal level of protection for *H. azteca* (that is, only "reasonable protection" in the parlance of the Staff Report). Adoption of these goals would not insure protection of the species, in fact, it virtually insures some degree of toxicity in samples that are in compliance. There are ecological reasons why this policy should be of concern, such as the fact that *H. azteca* can be a dominant species in some habitats, and in such environments, it is an important component in the diet of multiple fish species. However,

there are also very serious implications to toxicity testing as used for regulatory purposes. H. azteca was a widely used species for toxicity testing even before pyrethroids became of concern, and the species now plays an even greater role in testing. The dozens of studies documenting toxicity due to pyrethroids in California water bodies have been based on tests with this species. Toxicity to this species has been responsible for the many 303(d) listings attributable to pyrethroids. Given the pivotal role of this species in our water quality protection efforts, to set concentration goals that provide minimal protection for the species defies logic. It also raises the disturbing question of if we are not going to set goals that protect the species, then what is the point of monitoring water quality with it? It undercuts much of the toxicity testing now being done throughout California, and the management decisions, such as listing of impaired water bodies, that result.

RESPONSE: The best available science was used to conclude that the pyrethroid concentration goals based on the 5th percentile UC Davis criteria would be protective of beneficial uses and consistent with attainment of water quality standards. This conclusion was supported by the external peer review and two of three peer reviewers stated that the 5th percentile values would be protective of aquatic life and that the 1st percentile values are likely overly conservative. The 5th percentile values are also consistent with the level of protection recommended in USEPA criteria derivation guidelines (USEPA, 1985). The 5th percentile chronic (4-day or 96-hour) concentration goals are lower than, or, in one case, at the (96 hour) LC₅₀ for *Hyalella azteca*, indicating reasonable protection for even the most sensitive identified species. One-tenth of the 96-hour LC50 (lethal concentration to 50% of the tested population) for the most sensitive species is an alternative that the Board considered, as described in the Staff Report, but when there are fully developed criteria available, those are the preferable alternative as they are based on data from a range of species.

While it is true that, in the past, criteria utilized by the Water Boards for such constituents as diazinon and chlorpyrifos were lower relative to the toxicity data for the most sensitive species, the Water Code defers to the Board's judgment as to the "reasonable" protection of protection of beneficial uses. (Wat. Code, § 13241.) The proposed concentration goals, which are appropriately stringent, represent a reasonable protection of beneficial uses, given the unique challenges presented by pyrethroids. As described in the Staff Report and responses to comments, the Central Valley Water Board adopted the proposed Basin Plan Amendment with the concentration goals in careful consideration of these unique challenges, and how the concentration goals would be utilized in the control program. These unique challenges and policy considerations include attainability and costs, availability of analytical detection limits and potential impacts from alternative pesticides. The proposed concentration goals would require a significant improvement in water quality thus increasing protection of beneficial uses.

The proposed Basin Plan Amendment also includes toxicity testing, which will provide information on the potential additive and synergistic impacts of pyrethroids in combination with other stressors and the overall level of protection being attained. This additional information is expected to reduce the scientific uncertainty associated with the recommended approach. The toxicity monitoring will provide a backstop that will trigger follow-up action where needed based on toxicity results. For example, if toxicity results indicate toxicity in an environmental sample, an evaluation is conducted to try and determine the cause of toxicity (TIE). Should TIE results indicate that pyrethroids are the cause, and the levels of concern do not correspond with the freely dissolved chemistry

data, then adjustments to the pyrethroid triggers or partition coefficients or another aspect of the control program can be considered by the Central Valley Water Board.

While the proposed concentration goals are near or at levels where pyrethroids can be toxic to the test organism *Hyaella azteca* based on flow-through testing in laboratory water, the analysis in Appendix D of the Staff Report shows that the criteria successfully identified most samples with toxic levels of *Hyaella azteca*, and also identified as exceedances some samples which were not toxic to *Hyaella azteca*. The adoption of a control program with concentration goals approaching laboratory *Hyaella azteca* toxicity values does not change the Water Boards' long-standing finding that toxicity to this organism represents nonattainment of the narrative toxicity objective. Additionally, the TMDLs included in the control program include a numeric target that requires that sediment toxicity to *Hyaella azteca* be resolved.

The proposed Basin Plan Amendment also includes provisions for reporting to the Board every 15 years, re-visitation of the control program in 15 years, and for the development and implementation of a Pyrethroid Research Plan that may include research into toxic effects of pyrethroid that can inform the Board if adjustments to the concentration goals are necessary.

WESTON Comment No. 6 (Timeline for re-evaluation): The Staff Report and response to comments notes that the proposed approach has some limitations (most notably, in the case of the default partition coefficients), but portrays the approach as a phased one that can be modified as better information becomes available. The most troubling aspect of this approach is that re-evaluation is scheduled to occur in fifteen years. While it is possible that modifications could be made at an earlier time if Region 5 staff consider it warranted, the default option would be review in 2033 (assuming 2018 adoption).

There are radical differences in the proposed regulatory approach to pyrethroids, compared to historical practices for other substances, and the technical uncertainties of the proposed approaches are great, as discussed above. One approach would be to adopt a more traditional regulatory approach (e.g., total concentration) in the near term, while developing the technical support for the conceptually preferred, but currently unworkable, alternatives [e.g., bioavailability and partition coefficients]. But if the State Water Board elects to move ahead immediately with the proposed approach, I believe 15 years is far too long to continue with a scientific foundation as weak as it is. If a concerted research effort is made, some of the most egregious uncertainties could be re-evaluated in 3-5 years.

RESPONSE: The 15-year timeline for re-evaluation is needed to allow sufficient time for the development and implementation of practices through multiple iterations and to allow for collection of sufficient data to determine effectiveness of control efforts. However, in addition to requiring re-evaluation in 15 years, the proposed Basin Plan Amendment requires that the Central Valley Water Board will be updated on data collected and progress on implementation at least every 3 years following adoption of the Basin Plan Amendment and the Central Valley Water Board could require appropriate adjustments to the control program be initiated at that point. The development and initiation of the Pyrethroid Research Plan that is part of the control program will also provide a structure for ensuring the most valuable research is done in a timely manner to inform the control program.

WESTON Comment No. 7: If a concerted research effort is made, some of the most egregious uncertainties could be re-evaluated in 3-5 years. In particular, two areas need immediate study:

1) Efforts to develop a chemically-based criteria, whether incorporating bioavailability or not, are inherently a surrogate for toxicity testing. They are intended to protect aquatic life, without explicitly using that aquatic life to test every sample. The only way to determine if they have achieved their objective is a side-by-side comparison of toxicity test results with a chemical determination of whether the concentration goals were achieved. The Staff Report is vague on when toxicity tests will be required, and the staff's response to comments indicates it will be only some samples. At least in the initial years, concurrent toxicity testing should be the norm, and exceptions few or none. Though the proposed approach claims to provide "reasonable" protection for *H. azteca*, that claim is ill-defined, unproven, and in my view, dubious. Side-by-side testing is needed for its validation, and that testing should also note endpoints other than lethality, as my testing has short-term paralysis to be a common, and no less environmentally relevant, consequence of pyrethroid exposure.

2) As described in detail above, the default partition coefficients proposed are from a single sample in a pond on the other side of the country. Their relevance to the diverse water types to which they would be applied in California, and the degree of site-specific or time-specific variation around any one value, are both untested. Since the partition coefficients are pivotal to the bioavailability approach proposed, immediate validation is critical, and in my view, essential before any discharger could be defensibly found to be non-compliant. A 15-year wait for this capability is not tenable. Immediate investigation is needed as to whether a partition coefficient-based approach to bioavailability is workable, whether alternative bioavailability approaches have merit (e.g., Tenax extraction), or whether quantification of bioavailability for regulatory purposes is even achievable.

RESPONSE: In developing monitoring and reporting programs, and other monitoring projects such as monitoring under the Central Valley Water Board's Delta Regional Monitoring Program to implement to the pyrethroids control program, toxicity testing will be included. However, the Board must consider the expense of toxicity testing where it is imposed on the dischargers or performed or funded by the Board, so it may not be feasible to require toxicity testing with every sample. The monitoring under the control program will be designed to provide a robust data set, under the guidance provided under the Pyrethroid Research Plan, to have adequate side by side chemical and toxicity data to assess the protection being achieved. The notation of non-standard endpoints such as short-term paralysis will be considered in the development of monitoring and reporting programs and other monitoring projects, however the lack of agreed upon protocols for these endpoint is a concern that the Central Valley Water Board and stakeholders will also need to consider.

Partition coefficients have been identified as a topic for the Pyrethroids Research Plan, and the Central Valley Water Board has already begun pursuing contract funds to fund research into potential refinement of partition coefficients. Additional specific research on bioavailability may be identified and implemented as the Pyrethroid Research Plan is developed and funded and the control program and its associated monitoring implemented. However, it should be noted that the Central Valley Water Board has found, and peer-review has supported, that the proposed Basin Plan Amendments approach to quantification of bioavailability is a technically valid approach. See response to Weston no. 4 regarding the timeframe for re-evaluation.

7. WESTERN PLANT HEALTH ASSOCIATION (WPHA)

Comment letter was received by the State Water Board on November 2, 2017.

WPHA Comment No. 1: WPHA submits this letter in support of the Central Valley Water Board's actions and encourages the State Water Board to approve the Pyrethroid Amendment as adopted by the Central Valley Water Board. Further, WPHA joins the Pyrethroid Working Group (PWG) in their comments with respect to the Pyrethroid Amendment. We agree with the PWG that the Central Valley Water Board action to use triggers rather than water quality objectives, use 5th percentiles as concentration goals, and direct use of the bioavailable portion for calculation of the numeric triggers are appropriate and reasonable actions as compared to other more conservative alternatives considered by the Central Valley Water Board.

Accordingly, we request State Water Board approval of the Pyrethroid Amendment.

RESPONSE: Support noted.

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